

# Preface

*Focus in High School Mathematics: Reasoning and Sense Making* (NCTM 2009) captures the direction for high school mathematics for students in the twenty-first century:

Reasoning and sense making should occur in every mathematics classroom every day. In such an environment, teachers and students ask and answer such questions as “What’s going on here?” and “Why do you think that?” Addressing reasoning and sense making does not need to be an extra burden for teachers struggling with students who are having a difficult time just learning the procedures. On the contrary, the structure that reasoning brings forms a vital support for understanding and continued learning. Currently, many students have difficulty because they find mathematics meaningless.... With purposeful attention and planning, teachers can hold all students in every high school mathematics classroom accountable for personally engaging in reasoning and sense making, and thus lead students to experience reasoning for themselves rather than merely observe it. (NCTM 2009, pp. 5–6)

This new publication urges a refocusing of the high school mathematics curriculum on reasoning and sense making, building on the guidelines for teaching and learning mathematics advocated by NCTM in *Principles and Standards for School Mathematics* (NCTM 2000). *Focus in High School Mathematics: Reasoning and Sense Making* makes the case that reasoning and sense making must reside at the core of all mathematics learning and instruction, at all grades. Moving forward from *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics* (NCTM 2006), *Focus in High School Mathematics: Reasoning and Sense Making* also addresses the need for the continuation of a coherent and well-articulated mathematics curriculum at the high school level.

The underlying principles of *Focus in High School Mathematics: Reasoning and Sense Making* are “reasoning habits” that should develop across the curriculum, along with “key elements” organized around five content strands. The book provides a group of examples that illustrate how these principles might play out in the classroom. Historically, NCTM has provided supplementary materials to accompany major publications that present official positions of the Council (e.g., the Teaching with Curriculum Focal Points series for *Curriculum Focal Points for Prekindergarten through Grade 8 Mathematics*, the Navigations Series for *Principles and Standards for School Mathematics*, the Addenda Series for *Curriculum and Evaluation Standards for School Mathematics* [NCTM 1989]). In keeping with this tradition, a series of supplementary books, *Focus in High School Mathematics*, provides additional guidance for ensuring that reasoning and sense making are part of the mathematics experiences of all high school students every day.

This series is intended for secondary mathematics teachers, curriculum specialists, mathematics supervisors, district administrators, and mathematics teacher educators. *Focus in High School Mathematics: Reasoning and Sense Making* underscores the critical role of the Process Standards outlined in *Principles and Standards* and provides a foundation for achieving the principal goals for the mathematical experiences of all secondary school students. Each volume in the *Focus in High School Mathematics* series presents detailed examples of worthwhile mathematical tasks, along with follow-up discussion. The examples and discussions are intended to help classroom teachers understand what it means to promote sense making and to find ways to increase it in their classrooms. The material could also be used as classroom cases in professional development. In addition, supervisors, curriculum specialists, and administrators might use the examples and discussions to catalyze conversations about shifts in the high school mathematics curriculum to bring them into alignment with the goals of *Focus in High School Mathematics: Reasoning and Sense Making*.

Some of the books in the series focus on a particular content strand from *Principles and Standards* (e.g., geometry and measurement, algebra, statistics and probability), but they are not

intended to outline a curriculum for a particular content area. In fact, many of the examples in the books point to potential connections across content areas. This volume also looks across content areas but with a special emphasis on the unique opportunities for sense making and reasoning afforded by the appropriate use of technology.

The authors of the present volume, *Focus in High School Mathematics: Technology to Support Reasoning and Sense Making*, extend thanks to the following reviewers for providing valuable feedback and support during the development of the book: Gloria Barrett, Gail Burrill, Beth Chance, Wade Ellis, Charles Vonder Embse, Darshan Jain, James King, Doug Lapp, and Hollylynn S. Lee.

Special thanks to Judy Olson and Brendan Brennan for sharing with us a video of Mr. Brennan's mathematics classroom using a wide variety of technologies in support of mathematical reasoning and sense making. The last example (7.4) of chapter 7 is based on the classroom discourse appearing in that video.